John Brooks, MD, on what the CDC is doing to track variants

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In today's COVID-19 Update, John Brooks, MD, chief medical officer for the Centers for Disease Control and Preventions' (CDC) COVID-19 response in Atlanta, discusses the CDC's five-prong approach to track variants, including the B.1.1.7 variant (first detected in the U.K.), the B.1.351 variant (first detected in South Africa) and the P. 1 variant (first detected in Brazil). Dr. Brooks also discusses a recent study on the potential benefits of wearing a cloth mask over a clinical mask, or double masking.

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Speakers

- John Brooks, MD, chief medical officer, COVID-19 response, CDC

Transcript

Unger: Hello, this is the American Medical Association's COVID-19 Update. Today, we have a special guest, Dr. John Brooks, who's the chief medical officer of the CDC's COVID-19 response in Atlanta, and he's going to take us for a deeper dive into variants. I'm Todd Unger, AMA's chief experience officer in Chicago. Dr. Brooks, welcome. I thought we would start with a question that's been on my mind. Can you tell us how these variants are getting named? Where does B.1.1.7 come from?

Dr. Brooks: Todd, thanks very much for the opportunity to be here today. So it's rather complex. There's a group that has established a nomenclature by following lineages, and I'm not exactly sure how they chose B or P or any of the other letters, but just know there is a group that is officially following these and they're being defined mostly genetically according to the genetic sequence that

that variant carries.

Unger: Wow. Okay. Well, I'd like to walk through some of these different variants. The first one that I mentioned the B.1.1.7 variant, that we first saw in the U.K. Can you take us through how this differs in terms of transmission and vaccine effectiveness and where are we seeing this developing in the U.S.?

Dr. Brooks: Right. So this was, really, the first big variant that's been identified and followed. There was a one previously called the D614G variant, but that was early in the summer, but this is the one that people are paying a lot of attention to now. And it's the one that's most common in the United States. First arose in the United Kingdom, that's at least where it was first detected. And as a result, it's often referred to as the U.K. variant, but we prefer to stick to the number B.1.1.7. It's been identified in at least 87 countries right now. And we've got over 2,000 cases in the U.S. from 45 states, mostly Florida, Michigan and California. The good news about this variant is that it doesn't seem to escape the vaccine. Looks like our present mRNA vaccines will provide effective immunity against this, but it is more transmissible.

Estimated to be approximately 50% more transmissible than prior circulating strains. And there's also some evidence that it may be more severe and more likely to cause death. These are analyses that come from the U.K. where, because of the greater number of these infections, they've had the chance to kind of epidemiologically and clinically interrogate what's going on and what they've found, and it's a fascinating group, by the way, they have the acronym, NERVTAG, N-E-R-V-T-A-G, that's the New and Emerging Respiratory Virus Threats Advisory Group.

Unger: They have a better naming convention than the virus.

Dr. Brooks: NERVTAG. I mean, that just really sounds like they're business. So ... they were the ones who first kind of established that 50% more transmissible also looks like it may cause more severe illness somewhere between 30 to 60% more severe illness. And so we're watching that closely. We haven't got evidence for that in the U.S. yet, but that's in part because the number of infections is relatively low and the number of deaths from those infections is relatively low.

Unger: Can you just tell me why is it more transmissible? What is it about the variant?

Dr. Brooks: It's not precisely understood, but I think the leading hypothesis and data are growing behind this is that this variant is defined as a variant because there's been a mutation. And that mutation has led to a change in the structure of the spike protein, those little spiky, red things you see in a lot of the graphics on TV sticking out on the virus. Now this is the protein that is used to bind to the target cell. It binds to the ACE receptor, and the genome in the virus, as I'm sure many listeners know, defines the protein and that protein assumes a three-dimensional shape when it's sitting on top of the virus. And that shape fits nicely, right to the receptor very closely, okay? But it's not perfect. And sometimes mutation will lead to a change in the shape of that spike protein or what we call a

conformational change that lets it bind even tighter.

So, a virus that can bind tighter, it takes less virus to infect. It can spread and grow in the body more quickly because a single number of virus particles could infect more cells. That means you may achieve a higher viral load. And that means that the person who is then sick and infected could be spreading more virus in their respiratory exhalations than a person with a regular circulating strain. So, we think the reason for the greater transmissibility and infectivity is due to this conformational change in the virus caused by the mutation.

Unger: All right, well, we've got two other variants, one that's from South Africa and then another from Brazil. And there's been a lot of concern about these variants and how they relate to the effectiveness of vaccines. Can you talk about what's causing that concern and just how predominant these variants are in the U.S.?

Dr. Brooks: Sure. So, these variants, interestingly, they're an example of what we call a convergent evolution, which means that the same set of mutations developed in two viruses coming from two different lineages on two different continents. So what that says is that this mutation is doing something that is favorable to the virus. Natural selection is favoring these from developing. Now, that's a triplicate of mutations that occur in the spike protein predominantly, and the part of the spike protein that binds to the receptor called the receptor binding domain. And there's one in particular that you may have heard of it's called E484K, or sometimes refer to as "eek" because we don't like it very much.

Unger: I did not know that's the derivation of the word eek. I thought that was some other thing with fear of this variant and now, I know.

Dr. Brooks: Well, that's funny, we sometimes, I'll come back to this in a minute, about why we talk about scariants a little bit, and those are the ones that are prevalent, but not as worrisome as these two. And let's talk about these two first. So B.1.351, first recognized in South Africa and Zambia, 49 countries, 49 states, sorry, 15 states and 49 in the U.S., and P.1, first identified in Brazil, fewer countries about 19 countries worldwide, and only six cases in the U.S. so far in five states. And they share these mutations that make it more transmissible, but they also seem to alter how the virus may be controlled both by natural immunity, by monoclonal therapeutics and by vaccine. So with regard to monoclonals, both variants seem to be pretty resistant to one of the monoclonals, but not so much to some of the others.

In terms of vaccination, these mutations in the laboratory have seen, it looks as if there's reduced, pardon me. It looks as if there's reduced neutralization against this variate with SERA that were induced by vaccination with both the Pfizer-BioNtech vaccine and the Moderna vaccine. So reduced neutralization against this variant with vaccine induced SERA from BioNtech Pfizer vaccine, and Moderna, but it hasn't been that reduced neutralization is not below the limits at which we expect the

vaccines to work. We're still waiting for more human data, but we don't see anything terrifically worrisome right now. And then in terms of ...

Unger: ...that's really good news.

Dr. Brooks: That is good news. It is good news. And just I want to mention one nice thing about these mRNA vaccines that really makes them so flexible in such a fascinating development. These vaccines basically code for the mRNA, we inject that into people in a special way that the cell, the immune cells can pick it up and churn out copies of the target we want your immune system to go after. And if that target changes, if the shape of the spike protein changes, well, we can change the code in the mRNA to teach your immune system how to look for that one. It's a lot faster and easier to change that code than it has been in the past to have to grow up virus, and either de-arm it to make it weak or bust it up, so it can't attack you. This is a very elegant, and it can be hopefully a very rapid solution to the development of variants.

Unger: Yeah, we had Dr. Paul Offit on a few weeks ago. And I asked him that question about are we starting from scratch here? And he said, "No, producing a new vaccine to cover some of these variants is a relatively short process. It's the manufacturing and distribution part where all the time comes in." So it's really a miracle when you think about it.

Dr. Brooks: Well, it was one of those miracles of modern medicine. They just keep coming, thankfully, huh?

Unger: And this particular, the mutation, the variant from Brazil, I mean, had read that and is Manaus? Is that how you say that?

Dr. Brooks: That's correct.

Unger: Where it's almost three quarters of the population had contracted that, is that correct?

Dr. Brooks: That's right. It looks as if, about, at least 70% of the population has been infected with that variant. So it moved very quickly. Manaus is the capital of the state of Amazonia, a very big trading center along the river.

Unger: That's amazing. So, the appearance of these variants, obviously very scary and there are a lot of them, you say some of them kind of rise to the top, you call them scariants. I like that word a lot. Can you talk about the surveillance efforts that are underway at the CDC to track these variants and how do they inform our response?

Dr. Brooks: Sure. Well, this is something we take very seriously. And we have, even prior to this pandemic, we've had a system in place called advanced molecular detection or AMD designed to do

this kind of work. But since November, we've been supplementing that very substantially, we've gotten $200 million to build on our existing capacity. And in the current proposed American Rescue Plan, we have put in a request for a supplement of $1.75 billion. We really want to make sure America's ready to look for these. What we're currently doing is really a five pronged approach. The first is that we have a program called National SARS-CoV-2 strain surveillance called NS3. This is carried out in all states and we're hoping to get at least 750 new sequences a week from that.

In addition, we've been directing contracts to large laboratories, which do a lot of diagnostic testing and asking them to sequence a certain number of those that are coming in. We're presently up to 6,000 a week with those contracts. And again, weeks that we anticipate boosting them very substantially. We hope indeed to get to 25,000 sequences per week. And that's not only those two activities, but also through contracts we have with universities as the third building on that program, I mentioned, advanced molecular detection, that's the fourth. And then something called the SPHERES Consortium, S-P-H-E-R-E-S, which is a large consortium of both government and non-government academic centers and public health agencies who are sharing information.

Unger: Well, that's incredible news because obviously kind of tracking that along the way is really your first line of defense against preparing. Is that not right?

Dr. Brooks: Well, I would say that's partly true. I mean, our first line of defense against this virus to begin with is these prevention measures that we've been pushing so far in the vaccination. But I think what's important about sequencing is we can identify worrisome strains earlier. And we can also, particularly through the NS3 effort, actually get samples of the virus so we can learn more about that virus. How does it work? What does it look like? What's its genetic structure. I did want to just reassure people, some people are often asking, "Well, is this enough sequencing in the United States? Are we doing enough?" And presently we estimate we're sequencing about 3% of all isolants. To put that into perspective, the United Kingdom has been doing about five to 10% of theirs. Of course they have less disease.

And the largest number I'm aware of, I think is Denmark, which may be up to 20%, but of course they have a smaller denominator, so the absolute number may not be that great. But the point I want to make is that if we can get up to 5,000 a week, which we're at now, we estimate that that gives us an 80% chance of picking up at least three cases of prevalent infection if it constituted 5% of what's currently circulating. So, that's pretty good. And that's going to just get better as we approach 25,000 per week.

Unger: That's great news. Obviously you are concerned that new variants might emerge, that could threaten our mitigation efforts. Is there anything we should be doing beyond the surveillance right now to prepare for that scenario?

Dr. Brooks: I mean, I want to just say to folks the things are looking really good. We're watching us

come off the backside of this terrible holiday seasons spike. And you may feel as if I can ease up a little bit, and particularly with the vaccine coming through we're all feeling like we can take a little bit of a breath, but we've done some modeling. And so have some other groups and their forecast, if you will, sort of aligns with ours, which is it's possible that these variants could lead to another uptick in new cases, possibly another surge. And knowing that I think we really want to emphasize to people that, "Yeah, things look good, but now is the time to really capture and solidify that progress and that success." I know people want to let up, but until we really get farther to the end of the line, we need to continue practicing all of these mitigation measures. It's really critical for people to follow physical distancing recommendations, avoid crowds and poorly ventilated inside spaces and masking, keep masking, that really does make an enormous difference.

Unger: Yeah. There's a lot of discussion out there about why are we seeing these numbers come down and right now kind of not a silver bullet, but of course, behavior change, which includes following those guidelines that you just outlined in terms of masking and social distancing, obviously play a big role in that. And it's important to encourage people not to let their guard down right now to avoid kind of the resurgence of this.

Dr. Brooks: Yeah. And let me add that there's good evidence how this can work, in South Africa, that B.1.351 variant that now is predominant. I would say, last I heard was over 90% of infections. They're seeing their numbers now coming down without vaccination, but by really carrying out tighter policies to mitigate. So these measures work.

Unger: Well, speaking of tighter policies and taking that literally, let's talk about masks because you're the lead author of a new CDC study that provides new evidence on masks and transmission. Can you talk about the key findings in that study?

Dr. Brooks: Right. So what we wanted to do was understand how can we help people make the mask they're using really work better for them? Okay? First of all, we recommend any mask is better than no mask. We just want get people to wear masks, and if they're wearing them, then the next step is to wear them correctly and consistently as we recommend. And when you get to that, the next step is to make it fit better. We know that when you fit a mask that not only reduces how much virus you might exhale, if you're infected, but also can improve the protection you get as wearer from what you might inhale. So we looked at a couple of methods to improve the fit of these medical procedure masks. They're also called surgical masks. They're those rectangular pleaded masks that often loop behind the ear.

Those are notoriously leaky. They're used a lot in the medical setting, but a lot of folks may not recognize right away that they were developed as source control, not as a form of wearer protection. Surgeons wear those masks in the operating room so that their oral flora don't get into a sterile field. So it's to protect the patient, but they're made of a great material, most of them are made of a material that's called polypropylene, either spunbond or meltblown polypropylene. And no, I did not know that

a year ago, but I have learned a lot about this fascinating field. And we're like, "Gosh, how can I make that material really work better at filtering the exhalation and inhalation?" Because otherwise it's all leaking around the edges. I mean, I don't know if you've worn these, you get them down around your nose.

But my face is a shape where I constantly had these side pockets open. I got to tape them down or something. Okay. What can you do? Well, people have thought about this. There's been some great ideas out there. One of them was a fascinating idea, put out by Monica Gandhi and Linsey Marr. Monica is a infectious disease physician at UCF and Linsey's an environmental engineer at Virginia Tech. And they said, "Look, what if you took that medical mask and put it against your face, and then you put a cloth mask over it." And the reason for that is not to build another layer of filtration, but rather cloth masks by the nature of the material conforms to the shape of our face better. They proposed that this cloth over medical mask maneuver might work. They even estimated that it could reduce exposure 90% or more. So that caught our eye.

So we said, "Huh, well, that's a great hypothesis, but nobody had tested it." Now, there are, I'll just point out, there are other things people have tested like these fitters you can put on, they're kind of uncomfortable for some people, but other people, they work great. A hosiery nylon sleeve, kind of upcycling pantyhose, if you will, you make it a little collar around your neck with it, pull it up over your mask. That works very well for some people. So we wanted to see how two other options worked. This cloth over medical mask, and then something called knotting and tucking, where you take that medical mask, put a knot down by the edge of where the two loops insert against the fabric. And then that brings those corners together and shuts down that side gap.

Well, what we found, which was fascinating to me is that whether I use the cloth over medical technique, or I do the knotting technique, each of those reduces the exposure of a wearer from the exhalations of a source by about 60 to 80% in an experimental simulation that we had set up with a source head that's producing particles, aerosol particles, and the size that we believe carry virus, and a receiver head over here, who's we've got a detector in the mouth so we know what's getting through. So they were pretty good on their own, whether it was just the source or just the receiver wearing it. But when both the source and the receiver were wearing it, the receivers exposure went down more than 95%.

Unger: That's amazing.

Dr. Brooks: It's really amazing. I want to be very careful. This does not mean that if you use this yourself out there in the public, you can be guaranteed a reduction of 95%. This is an experiment.And it'll take extra work to see how that translates when people get out there and start using these. Allof us have different shapes of faces and do things a little differently, but I think it makes a reallyimportant point, which is fit makes a difference because I should've mentioned, but I didn't that beforewe did any adjustments to these, we just used the masks as they were.

You didn't get quite as much reduction as you did when you added this fit, so this fit technique that helped. But more importantly, if everybody does it, that's where you're getting the bang for your buck. Our little community had two head forms. We called them appliable, elastromeric head forms or mannequins. So when they both were masked up the guy who was, or the girl over here who's getting exposed, this person and this person together reduced that guy's exposure. And it would have been the flip side, it worked the other way as well.

Unger: That's great news. I know I, myself, based on these guidelines have moved to a double mask. It's very comfortable that kind of combination of the cloth and the surgical mask. And I think your other guidance is that masks work, but they're not a substitute for physical distancing and people should still wear masks when they're six feet apart from each other. That's a really important thing.

Dr. Brooks: Yeah. We've been speaking, we think a lot about when things start to look better, which mitigation things can we start to pull back on, because we do want to get back together, as human beings, we're used to touching other people. And a lot of us are used to being physical in a normal and healthy way with other folks and we're social. So you want to be with other people. As we thought about this, I think the two last things that'll probably go will be the physical distancing recommendations and the masking. So, hang onto your masks. We're still going to need them for a little bit longer.

Unger: So can you talk a little bit more about that, because we've seen predictions from Dr. Fauci, that masks are going to last well into 2022. Why do these continue to apply to people, especially that have been vaccinated? It's kind of confusing. What's the guidance there?

Dr. Brooks: Right. So, let me, let me see how I can frame this. A lot of us just assume, and I certainly did as an infectious disease doctor early in my training that, wow, when you're vaccinated, you don't get the disease. And it's true that you don't get the illness, but it's not true that all vaccines are sterilizing, which means they prevent you from actually potentially becoming asymptomatically infected. And if you were to become asymptomatically infected, there's the possibility you could then be infectious to others and transmit. We didn't have the luxury of doing the research to determine if that was the case with these vaccines, because they were needed urgently during this pandemic. And once we knew that they prevented illness and death, it was incumbent on us to get them out to the public. We're now learning if this concept of possibly becoming asymptomatically infected even after

vaccination that could lead to bore transmission, we're learning to what extent that might be true.

Until we know that the fact we really don't want to let down our guard too much right now. So we're still recommending everyone to wear masks. I'll also just remind folks, these vaccines were 95% efficacious in the formal studies that were done. So, 5% of folks still got infected, it wasn't perfect. And in the, now the field work that's going on, where we're looking at how they perform when they're actually put into people's arms, we're still seeing very high vaccine effectiveness, 80s, 85%, but that's still not 100%. So, until we get everybody hopefully immune due to vaccine and not due to natural infection, once we get that number high enough, that's when we can start to think about whether we need to continue wearing masks. And I think that's going to be a ways off for awhile.

Unger: Well, thank you so much. I've really learned a lot today Dr. Brooks. Really appreciate you joining us for the COVID-19 Update. That's it for today's segment, we'll be back with another shortly. In the meantime, for more information on COVID-19 visit ama-assn.org/COVID-19. Thanks for joining us and please take care.
